1788A

R/C Manual

Companion to the Instruction Manual

IMPORTANT NOTICE

This is a **separate remote control manual** that was created to accompany the 1788A Instruction Manual to deal with remotely controlling the 1788A, use of the PC and Mac software, and use of the 1788A-R dedicated hardware remote control unit. Please be sure to maintain both manuals for reference.

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APHEX SYSTEMS

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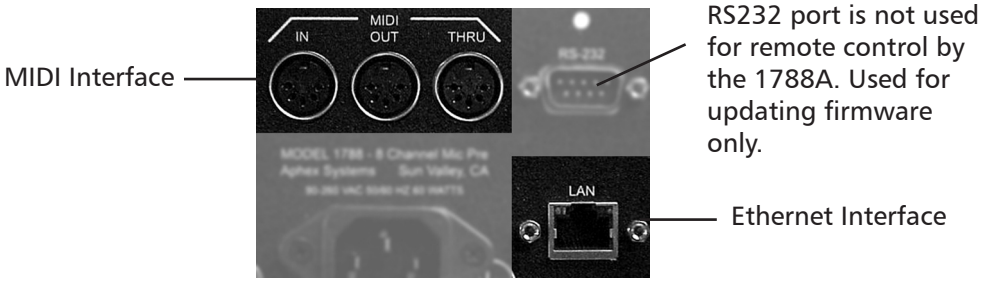
1. Overview of R/C (Remote Control)

Fig. 1-1
R/C Ports on Back of 1788A



1.1 R/C INTERFACE CONNECTORS

Only **ONE** source of control is accepted. Front panel selection of **MIDI** or **LAN** must be made on each 1788A. The 1788A always wakes up in the last mode used.

1.2 R/C INTERFACES

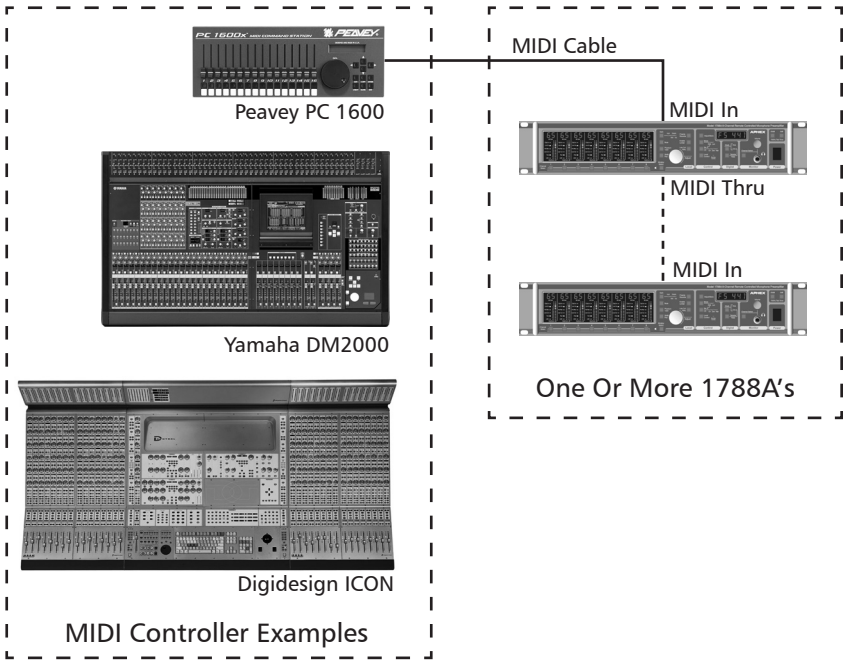
Control Language: MIDI SysEx

Whether using the 1788A's Ethernet LAN or MIDI ports, MIDI SysEx (system exclusive) strings are used for control.

Direct MIDI Control

In the most basic scenario, a wide range of MIDI devices can be used to control one or more 1788A's directly through the MIDI interface. For example, you could use a lighting or sound console to control the 1788A's channel gains and other functions.

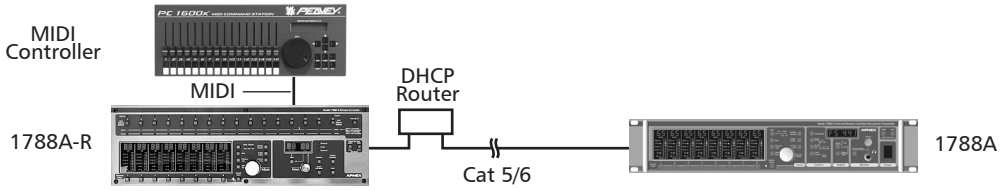
Fig. 1-2. Basic Direct MIDI Control Diagram



Indirect MIDI Control

MIDI controllers can access 1788A's through the LAN indirectly by interfacing with one or more 1788A-R's. A most basic example is illustrated below.

Fig. 1-3. Elementary Indirect MIDI Control

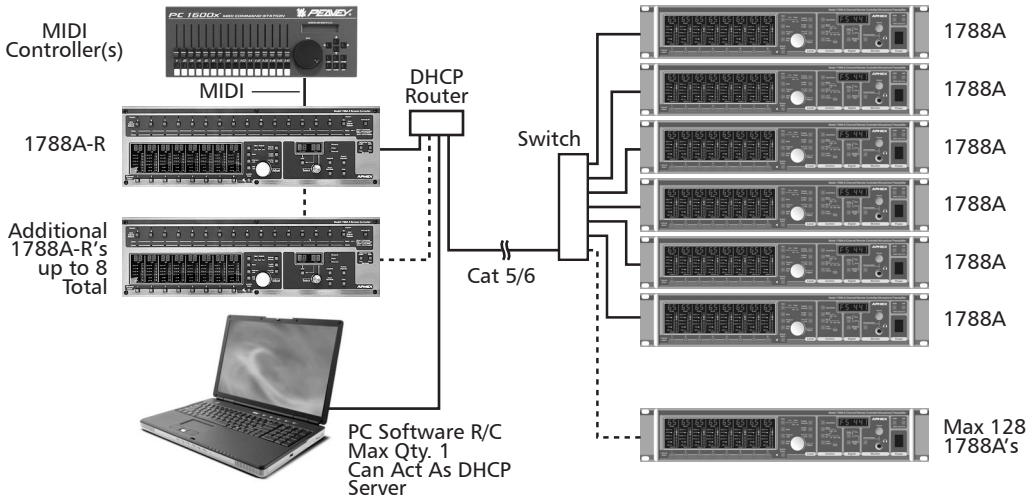


Ethernet LAN

Many applications call for more sophisticated remote control or control at greater distances than a MIDI port can handle. The Ethernet port is used to pipe UDP data between 1788A's and dedicated hardware and computer-based control surfaces over a Local Area Network (LAN). Up to 128 1788A's and 8 R/C units can be accommodated on a single LAN.

REFER to "Setting Up The LAN" for instructions on proper network hardware configuration.

Fig. 1-4. Some Of The Possibilities When Using A LAN



1.3 CONCEPT OF BANKS & CONSTELLATIONS

When under LAN connected control, 1788A's are addressed by their **NET NUMBER** which is manually assigned through each preamp's front panel. This NET number identifies it as an individual unit and as a member of a **BANK**. Banks are contiguous Net numbers in groups of 16 according to the following table:

Table 1-1. Bank Definitions

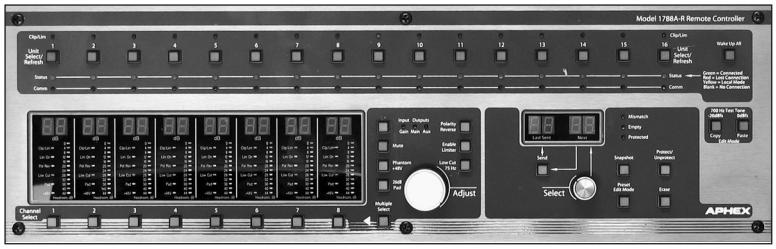
Bank No.	1	2	3	4	5	6	7	8
Net Nos.	1-16	17-32	33-48	48-64	65-80	81-96	97-112	113-128

A **CONSTELLATION** refers to the whole array of preamps attached to the same LAN. It may comprise only one 1788A or up to 128 of them. Preamps may be assigned NET numbers placing them in different banks even when any given bank is not filled. For example, you could have up to 16 preamps all within one bank, or assign them variously to as many as 8 banks. At the other extreme, you could have 128 preamps that occupy 8 fully filled banks. That's a damned lot of channels (1024).

1.4 HARDWARE R/C

Aphex manufactures a dedicated companion controller unit, the 1788A-R. Each 1788A-R can control a bank of up to sixteen 1788A's (equalling 128 microphone channels). Each 1788A-R has MIDI In and Through ports that can be used to extend remote control to MIDI control devices which will be directed through the 1788A-R to the targeted 1788A's. Communications between 1788A-R's and 1788A's is exclusively by LAN.

Fig. 1-5. 1788A-R Dedicated Control Surface



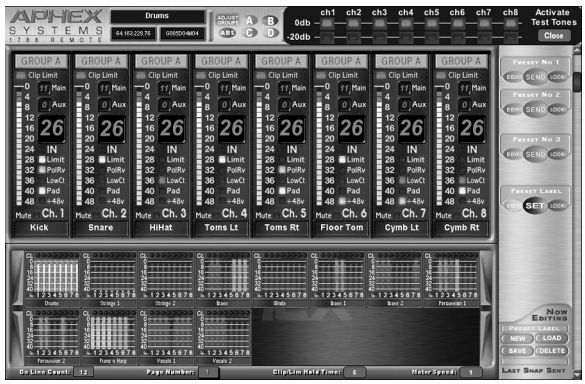
NOTE: One 1788A-R can control one of eight assignable banks. Up to eight 1788A-R's can be used to control up to eight banks of 1788A's.

Direct selection of any 1788A within a bank gives rapid access to all functions through a control surface that exactly matches the front panel of a 1788A including Group Select and Test Tones. The 1788A-R also supports Preset Store and Preset Recall within its bank. Remote control action as well as preset change propagation is fast and reliable.

1.5 COMPUTER R/C

Software developed especially for the 1788A is available for both PC and Mac platforms. Using a friendly GUI (Graphic User Interface) the software program makes monitoring, controlling and automating multiple 1788A's easier in many ways. It is certainly more economical than using multiple 1788A-R's for large installations.

Fig. 1-6. Example of a Software Control Panel



Preset Management

Software-managed presets are more extensive than using hardware controllers. Individual channel labels, group labels, and preset naming of up to 128 characters each in file save mode and 16 characters each in hardware save mode is supported. Preset Recall and Preset Store is easier to accomplish. Both "save to hardware" and "save to file" are supported.

NOTE: MIDI control is **NOT** accepted by the PC Software controller, even if the computer is outfitted with MIDI ports. When a LAN is used, MIDI controllers can gain access to a bank of 1788A's only through a **1788A-R** unit's MIDI port.

Wide System View

Enormous numbers of preamps can be displayed in thumbnail form and quickly switched to the main control area. Thumbnails indicate channel signal levels and flash to indicate if a channel is clipping to readily alert the operator of problem spots needing attention.

Massive Grouping & Control

Channel grouping of controls can be done across the constellation of 1788A's, not just within a single 1788A as with the hardware R/C. Four constellation groups are supported. This means you can assign any channel of any 1788A preamp to any one of the four groups. When any channel's control is changed, all others in that group change accordingly. If gain is changed, there are two user options: **Proportional** or **Absolute**. If Proportional is selected, grouped gains move proportionally. If Absolute is selected, all gains snap to the same gain as the channel that was adjusted.

1.6 COMBINED R/C

With minimal restraints, the hardware (1788A-R) and computer based remote control can co-exist on the same LAN. Any given control source takes priority at the instant it issues a command. All others that are online will update their references as necessary to reflect the change. Contention for control is taken care of by the proprietary UDP communications system. Jam-ups and lost control are prevented even while multiple controllers are busy making changes. There is no hierarchy of procedure. All controllers are peers.

1.7 ABOUT PRESETS

One of the most useful features available through R/C is the ability to save, edit and recall up to **60** presets.

Because of the flexibility built into the 1788A and its remote controllers, a distributed approach was used for storing preset data in hardware.

60 bank-wide presets can be memorized in each 1788A-R. Each of the 60 presets contains enough data to define the entire state of the each of the 16 positions in the bank. The preset memory also stores the preset's given label, the preamp's given label, and all given channel labels, (up to 16 characters long each) all of which must be defined through the PC remote software.

Each 1788A contains its own memory dedicated to storing the current machine state. The last preset propagated is stored in the 1788A's memory enabling it to wake up in its prior state should the preamp become powered down.

NOTE: 1788A-R hardware remote cannot create or display a preset label (only a number), preamp label, or channel labels.

Management Extents

Storing and recalling presets can be done only by remote control. Recalling presets can be done by indirect MIDI as well as by the 1788A-R and the PC software R/C. The extent of preset management depends on the form of R/C according to the table below.

Table 1-2. Preset Management Extents

	MIDI	1788A-R	Software R/C
Capture Constellation	No	No	Yes
Capture Block	No	Yes	No
Recall Constellation	No	No	Yes
Recall Block	Yes	Yes	No
Preset Labeling	N/A	No*	Yes

* Presets are stored by name but displayed by number only (1-60).

Constellation and Bank Capture/Recall

Since one 1788A-R controller can address only one bank, it can only capture the state of its own bank. This is typically no limitation since it is rare to see more than 16 1788A's (which can fit in one bank) in a whole system. That's 128 mic channels which covers all but the most elaborate sound installations. One 1788A-R will provide total preset/recall capability for a one-bank constellation of up to 128 mic channels.

NOTE: Sometimes, for operational convenience, a smaller number of preamps are assigned by NET numbers to two or more unfilled banks. Therefore, more than one 1788A-R will be installed and assigned to the multiple banks. Banks do not have to be filled to create a viable constellation.

Hardware Recall

An operator could manually use controls on each 1788A-R to individually recall numbered presets one by one. When only one 1788A-R is in control of the whole constellation, this is a simple operation. However, it may be less convenient if more than one 1788A-R is in use, requiring the operator to manually recall from each R/C unit.

Hardware Capture plus MIDI Recall

In a show control scenario, a MIDI controller can be used to recall presets that are to be enacted regularly. In that case, it would be connected to the 1788A-R MIDI ports and be programmed to send a sequence of Preset commands to tell each 1788A-R in turn to recall a specified preset number. An existing mixing or lighting console or small stand-alone MIDI controller unit can suit the purpose of automating recalls.

Software Presets

The software R/C running on a PC or Mac integrates all the bank functions universally and can not only capture a whole constellation snapshot, but also command a constellation preset change with mouse-click ease. Project management is provided with a file system for saving and recalling constellation presets, assigning preamp unit and channel labels, preset labels, and other essential information.

The software remote can handle communications with all 1788A's in the constellation directly. Even when one or more 1788A-R's are detected, the software directly transmits control to all 1788A's. It also communicates with all 1788A-R's to keep them synchronized. This harmony improves remote control reliability and the speed of propagating a preset change or saving a project to hardware (the 1788A-R's 60 bin snapshot memory).

1.8 WRAP-UP

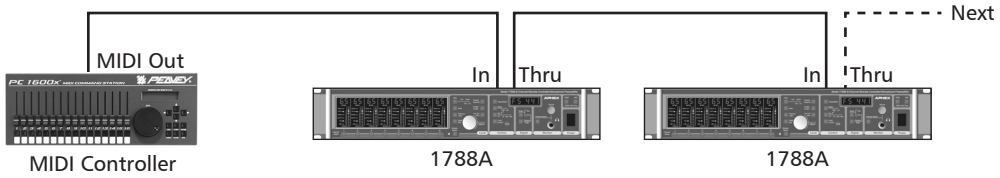
R/C of a single 1788A or a large constellation can be as simple or as sophisticated as you may want. Great flexibility is given in the extent and division of R/C positions. Preamps and R/C positions can be physically spaced over an Ethernet LAN. PC or Mac software giving total constellation access and control can be placed at one R/C position. Hardware-based dedicated controllers have bank controlling ability but not necessarily constellation access. Up to eight hardware controllers can coexist with one software controller. Up to 60 presets are hardware and software supported. Bank data for up to 60 presets is stored in the 1788A-R's for maximum flexibility. File storage of constellation snapshots is supported by software. Software projects can created and file-saved containing an entire database of all defined groups, preamp labels, preset labels, and channel labels to the depth of all 60 potential preset definitions. Aphex makes you happy.

2. Using MIDI

2.1 DIRECT MIDI CONTROL

MIDI control can be piped directly to a 1788A's MIDI Input port from any suitable controller. Suitable controllers are devices such as mixing or lighting consoles or stand-alone MIDI controllers that have programmable physical controls such as pushbuttons and sliders which can send SysEx strings to a MIDI port.

Fig. 2-1. Direct MIDI Control Hook-up



2.1.1 Determining Channel & Device Numbers

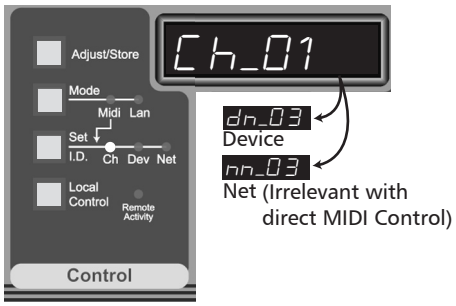
Channel & Device

You will need to establish **channel** and **device** numbers on your 1788A's. The objective is to choose channel and device numbers that are not used by any other MIDI devices connected to the controller's MIDI output port. If your 1788A constellation is the only thing on the controller's output port, then you can take channel 1 for all 1788A's and give them each a unique device number. The device numbers don't need to be sequential or contiguous, but they need to be unique. You will need to know these numbers in order to identify which preamp you want to access when programming the MIDI controller later on, so write down this information when you set up your 1788A's.

2.1.2 Procedure for Setting The Numbers

1. Place the 1788A in **Local** control.
2. Press **Mode** to select **MIDI**.
3. Press **Set I.D**. to select **Ch**. (Channel)
4. Press **Adjust/Store**. It will light up.
5. Set the displayed number using the **Adjust** dial.
6. Press **Set I.D.** to select **Dev**. (Device)
7. Repeat step 5.
8. Press the **Adjust/Store** button again. It will store the new numbers and the button light will go off.

Fig. 2-2. 1788A Control Panel



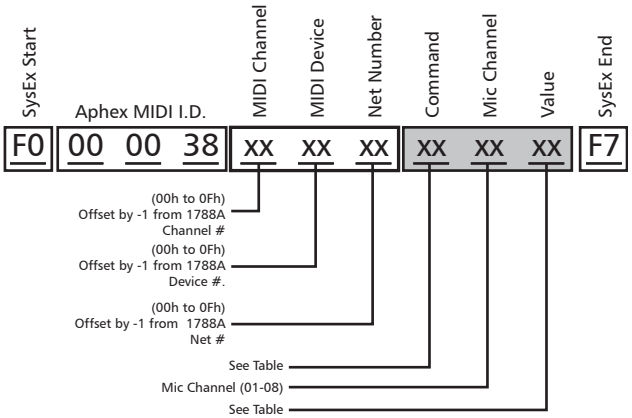
NOTE: With direct MIDI control there will be no LAN connection. Therefore the NET number is **irrelevant** and can be set to anything.

Refer to section 4.2 of the 1788A Instruction Manual for more information about setting the Channel, Device, and Net numbers if you are experiencing difficulty.

2.1.3 1788A's Direct MIDI SysEx Strings

Direct MIDI SysEx strings are exactly the same as the parametric strings used for indirect MIDI control (described later). When filling in the three bytes in the grayed area, refer to reference data at the end of this chapter. See figure 2-3.

Fig. 2-3. 11-Byte Direct MIDI SysEx String



2.1.4 Understanding Ch, Dev and Net Offsets

Please observe two important facts about MIDI Channel, Device, and Net Numbers.

1. All three are displayed in decimal form on the 1788A and 1788A-R front panels. Ch and Dev go from 01 to 16 and Net goes from 001 to 128. You will need to convert decimal to hexadecimal for use in SysEx strings. A handy conversion table is located in this chapter's reference data.

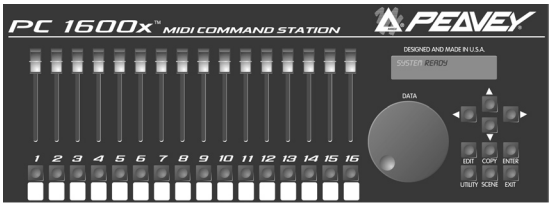
2. Channel, Device, and Net numbers in the SysEx strings must be programmed with an **offset of -1** from the numbers that are indicated on the 1788A's front panel readout. For example, if the 1788A is set to Ch 01, Dev 02, and Net 003, the SysEx code would look like 00 01 02, not 01 02 03. This may be confusing at first, but you will find it quickly becomes easy to deal with.

2.1.5 Setting Up The Controller

The method of programming a MIDI control varies from product to product. To successfully interface a MIDI control surface to 1788A's, you will need to learn the control surface. Once you have determined the way to program your controller, you can begin applying SysEx strings to the controls. We will next illustrate this process by using a general purpose MIDI controller, the Peavey PC 1600x. You can apply what you learn to any other MIDI controller with appropriate variations.

Here's how we're going to set it up. The MIDI controller will be set up to control the Input Gains of all eight channels of a 1788A. The pushbuttons under each fader will be programmed to activate/deactivate the Mutes of each channel.

Fig. 2-4. Example of MIDI R/C Unit


PC 1600x MIDI COMMAND STATION
PEAVEY
DESIGNED AND MADE IN U.S.A.
DATA
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
EDIT COPY ENTER
UTILITY SCENE EXIT

NOTE: We will refer to the Reference Data at the end of this chapter for command codes used by the 1788A.

When programming each control, use the following setup:

1. Single-byte transmit
2. Faders: string; Buttons: string toggle
3. Fader Limits: 26 to 65
4. Faders: use "pr" in the value byte. This is the PC1600's code for grabbing the fader's value.
5. For this demonstration, we're using command code 00 for Input Gain and 07 for Mute. We're declaring the 1788A is set for Channel 1, Device 1, Net 1.

Now program in the following strings:

Table 2-1. MIDI Strings for Demonstration

Fader 1	string	F0	00	00	38	00	00	00	00	01	pr	F7
Fader 2	string	F0	00	00	38	00	00	00	00	02	pr	F7
Fader 3	string	F0	00	00	38	00	00	00	00	03	pr	F7
Fader 4	string	F0	00	00	38	00	00	00	00	04	pr	F7
Fader 5	string	F0	00	00	38	00	00	00	00	05	pr	F7
Fader 6	string	F0	00	00	38	00	00	00	00	06	pr	F7
Fader 7	string	F0	00	00	38	00	00	00	00	07	pr	F7
Fader 8	string	F0	00	00	38	00	00	00	00	08	pr	F7

Button 1	string 1	F0	00	00	38	00	00	00	07	01	01	F7
	string 2	F0	00	00	38	00	00	00	07	01	00	F7
Button 2	string 1	F0	00	00	38	00	00	00	07	02	01	F7
	string 2	F0	00	00	38	00	00	00	07	02	00	F7
Button 3	string 1	F0	00	00	38	00	00	00	07	03	01	F7
	string 2	F0	00	00	38	00	00	00	07	03	00	F7
Button 4	string 1	F0	00	00	38	00	00	00	07	04	01	F7
	string 2	F0	00	00	38	00	00	00	07	04	00	F7
Button 5	string 1	F0	00	00	38	00	00	00	07	05	01	F7
	string 2	F0	00	00	38	00	00	00	07	05	00	F7
Button 6	string 1	F0	00	00	38	00	00	00	07	06	01	F7
	string 2	F0	00	00	38	00	00	00	07	06	00	F7
Button 7	string 1	F0	00	00	38	00	00	00	07	07	01	F7
	string 2	F0	00	00	38	00	00	00	07	07	00	F7
Button 8	string 1	F0	00	00	38	00	00	00	07	08	01	F7
	string 2	F0	00	00	38	00	00	00	07	08	00	F7

2.1.6 Connections

Connect a professional MIDI cable from the PC 1600x's MIDI OUT jack to the 1788A's MIDI IN jack.

2.1.7 Controlling Multiple 1788A's

Additional units can be stacked by connecting the MIDI THRU to the next MIDI IN, and so-on. If the added 1788A's are kept on the same MIDI channel, they must be given different MIDI device numbers.

The next step would be to program the additional controls on the MIDI controller with SysEx strings associated with the additional MIDI device numbers. For example, if one

additional 1788A is used, the second set of eight faders and buttons of the PC1600 could be coded exactly like the previous tables, except with the channel and/or device number changed to match the second 1788A. Remember, in this case, NET number is just a placeholder and can be anything.

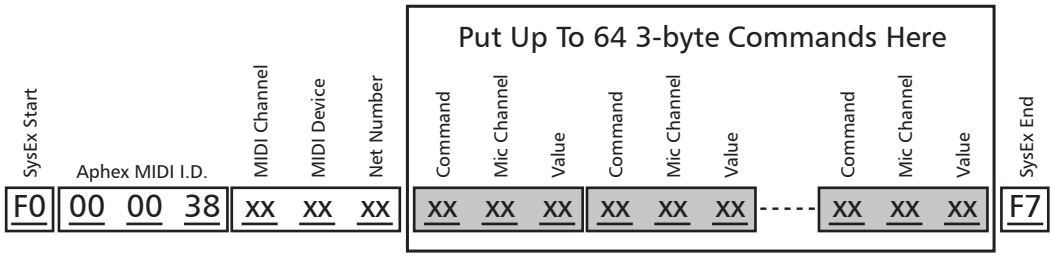
2.1.8 Broad Commands & Presets

It is possible to send many commands within a single SysEx string. This is more efficient than sending many 11-byte SysEx strings in sequence. By looking at the SysEx string illustration of figure 2-3, you'll notice a grayed out area comprising the command, mic channel and value bytes. By simply repeating these three bytes containing additional commands, mic channels and values, you can cause the same 1788A to update every function in all mic channels or any combination. This could be considered a preset "done the hard way".

Limitation:

You can also use this way to send a single fader or button to multiple mic channels of the same 1788A. The only limitation is that you can have only one MIDI channel and one device number per SysEx string. Therefore, this technique can create a preset or broad command for a single 1788A but not multiple 1788A's.

Fig. 2-4. Broadening the Command String



NOTE: To effect a massive update of multiple 1788A's, you'll need to create a SysEx string for each unit. They can be concatenated (spliced together end-to-end) to make one very long string or sent separately.

2.1.9 Learning a Preset

Many MIDI controllers have a **Learn** mode. This can help you speed up the process of writing a long SysEx string to use as a preset. 1788A's have a secondary function that will send a SysEx dump to the MIDI Out port in the form of a properly formatted string. Simply place your MIDI controller in Learn Mode, and while it is waiting for a signal, press **both Tone buttons** and the **Channel 5** button, then release. A SysEx packet containing every parametric value in the 1788A will be sent. No labels or other superfluous data will be included. This SysEx string will be learned as the output string for the chosen MIDI controller's pushbutton.

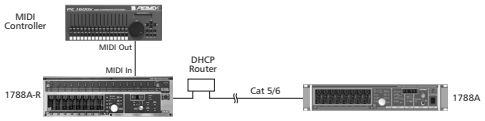
You will have to edit the SysEx string to put in the 1788A's correct MIDI channel and device bytes, since the numbers that were learned would have been the I.D. of the MIDI controller itself. Once this is done, you can rapidly return the 1788A to these parameters just by pushing the MIDI controller button. To implement multiple 1788A's, you will need to learn the string from each 1788A into a separate MIDI controller button. To recall a preset across several 1788A's, you would press several buttons.

2.2 INDIRECT MIDI CONTROL

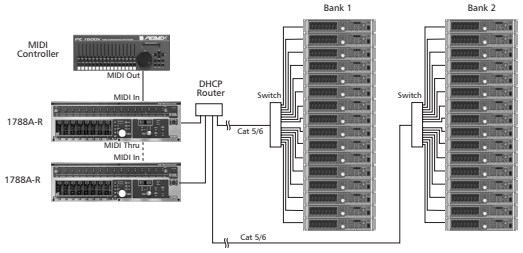
If you want to employ a MIDI form of control when the 1788A's are connected to R/C units by LAN, direct connection to the 1788A's MIDI ports cannot be used. This is because only one R/C medium can be accepted by the 1788A at a time: LAN or MIDI. When LAN is selected, the 1788A's MIDI port is disabled. However, we built MIDI capability into the 1788A-R hardware R/C unit to cover this situation.

Fig. 2-5. Indirect MIDI Control Examples

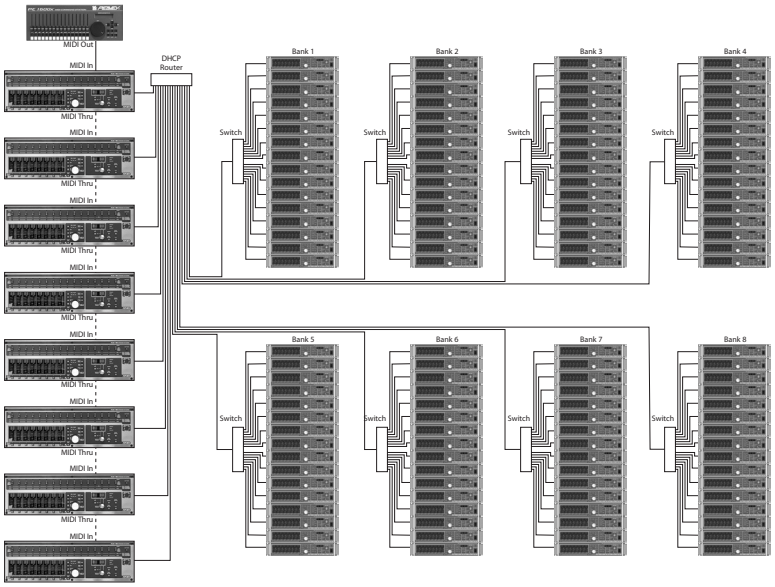
Small System



Larger System



Maximum System - 1024 Mic Channels!



2.2.1 Hardware Hook-up

Anything from a single 1788A to a large constellation can be controlled by indirect MIDI through 1788A-R's. Figure 2-5 suggests how this is done. The controller's MIDI OUT is connected to the first 1788A-R's MIDI IN. The next 1788A-R's MIDI IN is connected to the preceding MIDI THRU, and so on.

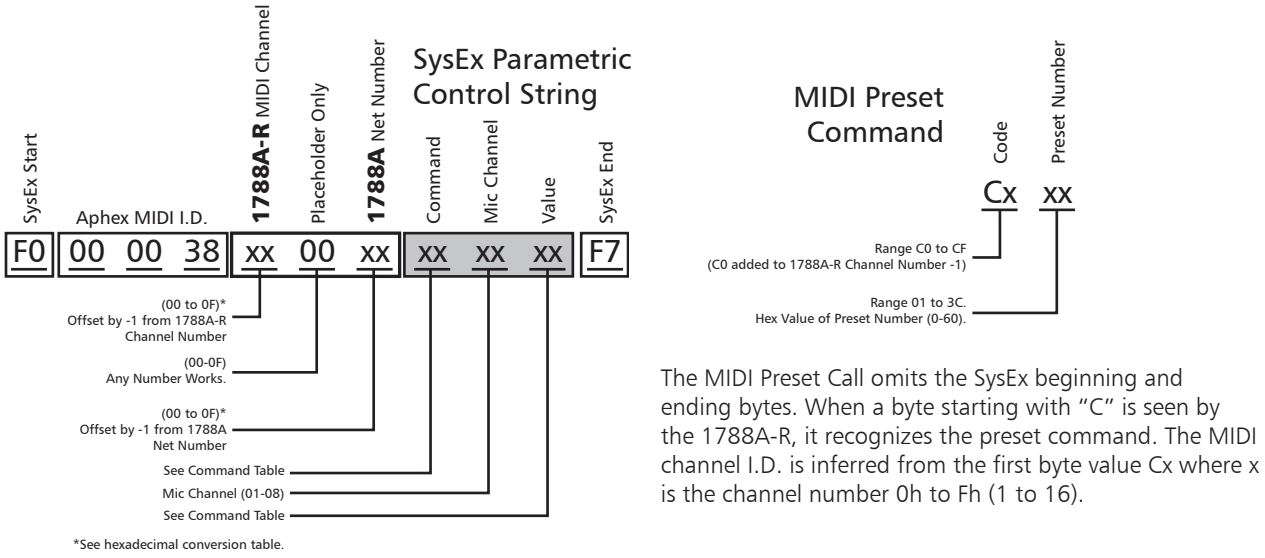
2.2.2 Control Assertion

Depending on your needs, there are two control assertions available to MIDI:

1. Parametric control of any mic channel across the constellation.
2. Recall of one of the 60 presets that are stored in the 1788A-R's memory.

In case 1, you will send one SysEx packet from the MIDI controller. The 1788A-R will then redirect commands across the LAN according to Net Number within its Bank. Additional 1788A-R's can be cascaded by using MIDI Thru looping to control more banks. In the second case, the MIDI Preset Recall commands are shorter, containing only 2 bytes. The following figure illustrates the composition of the parametric and recall strings.

Fig. 2-6. Two Kinds of Remote Control Assertion

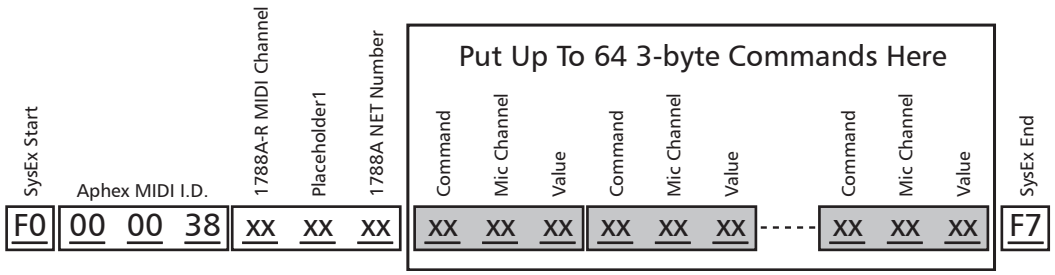


The MIDI Preset Call omits the SysEx beginning and ending bytes. When a byte starting with "C" is seen by the 1788A-R, it recognizes the preset command. The MIDI channel I.D. is inferred from the first byte value Cx where x is the channel number 0h to Fh (1 to 16).

2.2.3 Expanding the SysEx String

Just like direct MIDI control, you can repeat 3-byte commands within the parametric SysEx string to send multiple commands to a single 1788A as shown by figure 2-7.

Fig. 2-7. Expanding the SysEx String



NOTE: You cannot expand the 2-byte MIDI Preset string.

2.2.4 1788A-R's Odd MIDI I.D.

All 1788A-R units are I.D.'d a little differently than normal MIDI devices or the 1788A's direct MIDI port. There is no recognition of the MIDI Device byte, although it must be present as a placeholder in the SysEx string. Any value may be used. The MIDI Channel is responded to normally.

Refer to Section 3 to learn how to set up the MIDI Channel on the 1788A-R.

2.2.5 Daisy-Chained 1788A-R's

When you daisy-chain units by using the MIDI THRU ports, every unit will recognize the SysEx strings addressed to its MIDI channel. Each unit will analyze the NET Number contained in parametric strings and redirect any commands falling within its own bank, ignoring all others. If a 2-byte MIDI Preset command is received, the targeted 1788A-R will propagate its prescribed preset to its own Bank of 1788A's.

2.2.6 Preset Recall Strategy

Each 1788A-R is given a different MIDI channel number. MIDI controllers can then command a preset from any one or combination of 1788A-R's. Combinations can have different preset numbers assigned to create complex constellation presets. The MIDI controller will transmit a series of 2-byte MIDI Preset commands, one to address each 1788A-R.

Refer to Section 3 learn about the 1788A-R's stored presets and how they are

handled.

2.3 MULTIPLE MIDI CONTROLLERS

It should be normally possible to combine SysEx commands from more than one MIDI controller. However, the 1788A-R does not have facilities for merging. You'll probably need a commercially available MIDI merging box to receive the MIDI Outs from the multiple controllers and pass them to the 1788A-R(s).

2.4 CLONING 1788A's

Any 1788A can import the parameters and stored labels from another 1788A by cross-connecting their MIDI IN and MIDI OUT ports. This can be the easiest way to replace a defective unit in a bank (as long as the defective unit is not completely dead, naturally).

Synchronizing Procedure

1. Temporarily cross-connect the MIDI IN and OUT ports as shown in Figure 2-8.

2. Put both units in **Local Control**.

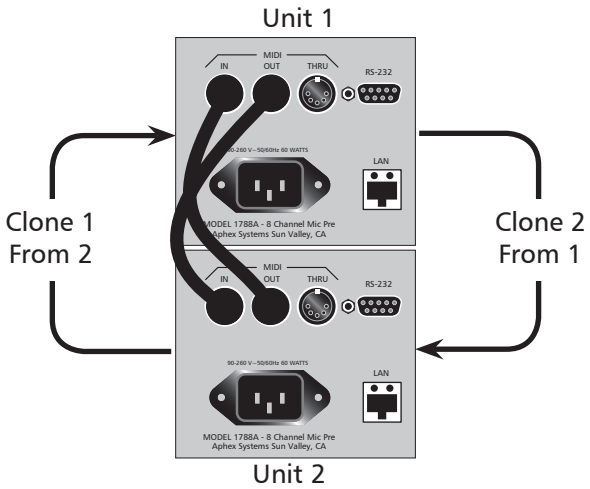
3. Program both units to the **same MIDI Channel and Device** numbers.

4. On the unit to be updated (the clone), press **both Tone Buttons** and the **CH 6** Select button then release. This transmits a dump request to the other unit (original).

The original unit will begin sending it's parametric and label data to the receiving unit. The sender will show a series of ten messages in the sender's display window indicating the transfer of ten blocks of data. The first eight blocks contains the preamp's mic channel labels of 128 characters, the next block contains the sixteen master unit labels of 128 characters each, and the last block contains the complete parametric map.

When the transfer is complete, the clone will update itself to the new parameters and the panel indicators will align accordingly. The updated unit is now a clone of the original and will power up with the updated settings.

Figure 2-8. Connecting Two 1788A's For Cloning

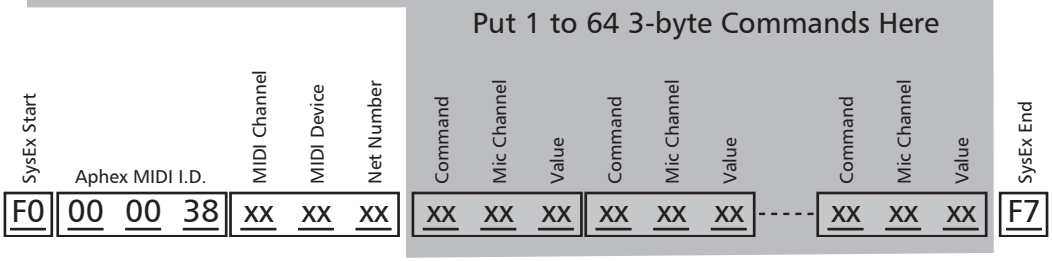


2.5 REFERENCE DATA

2.5.1 Parametric Codes & Values

1788A Parametric MIDI Commands

Command	Control	Value Range
00h	Input Gain	1Ah to 41h (26 to 65)
01h	Main Max Out	00h to 1Bh (0 to 27)
02h	Aux Max Out	00h to 1Bh (0 to 27)
03h	Phantom Power	00h = OFF, 01h = ON
04h	Low Cut Filter	00h = OFF, 01h = ON
05h	Limiter (MicLim)	00h = OFF, 01h = ON
06h	Polarity Reverse	00h = OFF, 01h = ON
07h	Mute	00h = OFF, 01h = ON
08h	Pad	00h = OFF, 01h = ON
0Ah	Test Tone -20dB	00h = OFF, 01h = ON
0Bh	Test Tone 0dB	00h = OFF, 01h = ON
17h	Test Tone (alternative method)	00h = OFF, 01h = -20dB, 02h = 0dB
20h	Request Parameter SysEx Dump	01h (required)
56h	Request Extended SysEx Dump	00h (any value placeholder byte)



System Exclusive (SysEx) Parametric Control String

2.5.2 Useful Conversion Tables

General Hexadecimal Conversion Table							
Dec	**Hex**	Dec	**Hex**	Dec	**Hex**	Dec	**Hex**
0	**00**	64	**40**	128	**80**	192	**C0**
1	**01**	65	**41**	129	**81**	193	**C1**
2	**02**	66	**42**	130	**82**	194	**C2**
3	**03**	67	**43**	131	**83**	195	**C3**
4	**04**	68	**44**	132	**84**	196	**C4**
5	**05**	69	**45**	133	**85**	197	**C5**
6	**06**	70	**46**	134	**86**	198	**C6**
7	**07**	71	**47**	135	**87**	199	**C7**
8	**08**	72	**48**	136	**88**	200	**C8**
9	**09**	73	**49**	137	**89**	201	**C9**
10	**0A**	74	**4A**	138	**8A**	202	**CA**
11	**0B**	75	**4B**	139	**8B**	203	**CB**
12	**0C**	76	**4C**	140	**8C**	204	**CC**
13	**0D**	77	**4D**	141	**8D**	205	**CD**
14	**0E**	78	**4E**	142	**8E**	206	**CE**
15	**0F**	79	**4F**	143	**8F**	207	**CF**
16	**10**	80	**50**	144	**90**	208	**D0**
17	**11**	81	**51**	145	**91**	209	**D1**
18	**12**	82	**52**	146	**92**	210	**D2**
19	**13**	83	**53**	147	**93**	211	**D3**
20	**14**	84	**54**	148	**94**	212	**D4**
21	**15**	85	**55**	149	**95**	213	**D5**
22	**16**	86	**56**	150	**96**	214	**D6**
23	**17**	87	**57**	151	**97**	215	**D7**
24	**18**	88	**58**	152	**98**	216	**D8**
25	**19**	89	**59**	153	**99**	217	**D9**
26	**1A**	90	**5A**	154	**9A**	218	**DA**
27	**1B**	91	**5B**	155	**9B**	219	**DB**
28	**1C**	92	**5C**	156	**9C**	220	**DC**
29	**1D**	93	**5D**	157	**9D**	221	**DD**
30	**1E**	94	**5E**	158	**9E**	222	**DE**
31	**1F**	95	**5F**	159	**9F**	223	**DF**
32	**20**	96	**60**	160	**A0**	224	**E0**
33	**21**	97	**61**	161	**A1**	225	**E1**
34	**22**	98	**62**	162	**A2**	226	**E2**
35	**23**	99	**63**	163	**A3**	227	**E3**
36	**24**	100	**64**	164	**A4**	228	**E4**
37	**25**	101	**65**	165	**A5**	229	**E5**
38	**26**	102	**66**	166	**A6**	230	**E6**
39	**27**	103	**67**	167	**A7**	231	**E7**
40	**28**	104	**68**	168	**A8**	232	**E8**
41	**29**	105	**69**	169	**A9**	233	**E9**
42	**2A**	106	**6A**	170	**AA**	234	**EA**
43	**2B**	107	**6B**	171	**AB**	235	**EB**
44	**2C**	108	**6C**	172	**AC**	236	**EC**
45	**2D**	109	**6D**	173	**AD**	237	**ED**
46	**2E**	110	**6E**	174	**AE**	238	**EE**
47	**2F**	111	**6F**	175	**AF**	239	**EF**
48	**30**	112	**70**	176	**B0**	240	**F0**
49	**31**	113	**71**	177	**B1**	241	**F1**
50	**32**	114	**72**	178	**B2**	242	**F2**
51	**33**	115	**73**	179	**B3**	243	**F3**
52	**34**	116	**74**	180	**B4**	244	**F4**
53	**35**	117	**75**	181	**B5**	245	**F5**
54	**36**	118	**76**	182	**B6**	246	**F6**
55	**37**	119	**77**	183	**B7**	247	**F7**
56	**38**	120	**78**	184	**B8**	248	**F8**
57	**39**	121	**79**	185	**B9**	249	**F9**
58	**3A**	122	**7A**	186	**BA**	250	**FA**
59	**3B**	123	**7B**	187	**BB**	251	**FB**
60	**3C**	124	**7C**	188	**BC**	252	**FC**
61	**3D**	125	**7D**	189	**BD**	253	**FD**
62	**3E**	126	**7E**	190	**BE**	254	**FE**
63	**3F**	127	**7F**	191	**BF**	255	**FF**

SysEx Channel & Device Translation Table			
1788A 1788A-R Channel (or Device)	True Hex Value	**Hex -1 Used For Parametric SysEx**	**Hex -1 + C0 Used For Preset SysEx**
1	01	**00**	**C0**
2	02	**01**	**C1**
3	03	**02**	**C2**
4	04	**03**	**C3**
5	05	**04**	**C4**
6	06	**05**	**C5**
7	07	**06**	**C6**
8	08	**07**	**C7**
9	09	**08**	**C8**
10	0A	**09**	**C9**
11	0B	**0A**	**CA**
12	0C	**0B**	**CB**
13	0D	**0C**	**CC**
14	0E	**0D**	**CD**
15	0F	**0E**	**CE**
16	10	**0F**	**CF**

2.5.3 MIDI Control Examples

Example 1

Direct MIDI. 1788A Ch set to 01, Dev set to 01, Net set to 001.

Set preamp gain to 45dB, mic channel 1

SysEx: F0 00 00 38 00 00 00 00 01 2D F7

Example 2

Direct MIDI. 1788A Ch set to 02, Dev set to 01, Net set to 001.

Set Limiter ON, mic channel 4

SysEx: F0 00 00 38 01 00 00 05 04 01 F7

Example 3

Direct MIDI. 1788A Ch set to 01, Dev set to 01, Net set to 001.

Set preamp gain to 45dB, mic channels 1 thru 8

SysEx: F0 00 00 38 00 00 00 00 01 2D 00 02 2D 00 03 2D 00 04 2D 00 05 2D 00 06 2D 00 07 2D 00 08 2D F7

Example 4

Indirect MIDI. **1788A-R** Ch set to 02, **1788A** Net set to 002.

Set preamp gain to 45dB, mic channel 1

SysEx: F0 00 00 38 01 00 01 00 01 2D F7

Example 5

Indirect MIDI. **1788A-R** Ch set to 02, **1788A** Net set to 002.

Set Limiter ON, mic channel 4

SysEx: F0 00 00 38 01 00 01 05 04 01 F7

Example 6

Indirect MIDI. **1788A-R** Ch set to 01, **1788A** Net set to 001.

Set preamp gain to 45dB, mic channels 1 thru 8

SysEx: F0 00 00 38 00 00 00 00 01 2D 00 02 2D 00 03 2D 00 04 2D 00 05 2D 00 06 2D 00 07 2D 00 07 2D F7

Example 7

Preset Recall to one or more 1788A-R's. All 1788A-R's Ch set to 1

Recall preset #1 **SysEx: CO 01**

Recall preset #2 **SysEx: CO 02**

Example 8

Preset Recall to eight 1788A-R's. 1788A-R MIDI Channels set 1 to 8

Recall preset #1 **SysEx: CO 01 C1 01 C2 01 C3 01 C4 01 C5 01 C6 01 C7 01**

Recall preset #2 **SysEx: CO 02 C1 02 C2 02 C3 02 C4 02 C5 02 C6 02 C7 02**

Example 9

Preset Recall to eight 1788A-R's. 1788A-R MIDI Channels set 1 to 8 and Banks set 1 to eight respectively.

This is an example of a complex recall.

Bank 1 preset 1, Bank 2 preset 2, Bank 3 preset 2, Bank 4 preset 4, Bank 5 preset 1, Bank 6 preset 6, Bank 7 preset 42, Bank 8 preset 60

SysEx: CO 01 C1 02 C2 02 C3 04 C4 01 C5 06 C6 2A C7 3C

Example 10

Direct MIDI. 4 1788A's with MIDI Channels set to 01, Dev set to 01, 02, 03, and 04. Net set to 001 (this is not important). Looped through MIDI Thru jacks.

Mute all 32 mic channels.

F0 00 00 38 00 00 00 07 01 01 07 02 01 07 03 01 07 04 01 07 05 01 07 06 01 07 07 01 07 08 01 F7 F0 00 00 38 00 01 00 07 01 01 07 02 01 07 03 01 07 04 01 07 05 01 07 06 01 07 07 01 07 08 01 F7 F0 00 00 38 00 02 00 07 01 01 07 02 01 07 03 01 07 04 01 07 05 01 07 06 01 07 07 01 07 08 01 F7 F0 00 00 38 00 03 00 07 01 01 07 02 01 07 03 01 07 04 01 07 05 01 07 06 01 07 07 01 07 08 01 F7

It's easier to it see this way:

F0 00 00 38 00 [00] 00 [07 01 01] [07 02 01] [07 03 01] [07 04 01] [07 05 01] [07 06 01] [07 07 01] [07 08 01] F7
F0 00 00 38 00 [01] 00 [07 01 01] [07 02 01] [07 03 01] [07 04 01] [07 05 01] [07 06 01] [07 07 01] [07 08 01] F7
F0 00 00 38 00 [02] 00 [07 01 01] [07 02 01] [07 03 01] [07 04 01] [07 05 01] [07 06 01] [07 07 01] [07 08 01] F7
F0 00 00 38 00 [03] 00 [07 01 01] [07 02 01] [07 03 01] [07 04 01] [07 05 01] [07 06 01] [07 07 01] [07 08 01] F7

Un-Mute all 32 mic channels:

F0 00 00 38 00 [00] 00 [07 01 00] [07 02 00] [07 03 00] [07 04 00] [07 05 00] [07 06 00] [07 07 00] [07 08 00] F7
F0 00 00 38 00 [01] 00 [07 01 00] [07 02 00] [07 03 00] [07 04 00] [07 05 00] [07 06 00] [07 07 00] [07 08 00] F7
F0 00 00 38 00 [02] 00 [07 01 00] [07 02 00] [07 03 00] [07 04 00] [07 05 00] [07 06 00] [07 07 00] [07 08 00] F7
F0 00 00 38 00 [03] 00 [07 01 00] [07 02 00] [07 03 00] [07 04 00] [07 05 00] [07 06 00] [07 07 00] [07 08 00] F7

Summary

We hope the information, references and examples in this chapter will make understanding MIDI control a lot easier for you. A little time spent studying this material may save you many hours of frustration and grief later on. Contact Aphex tech support should you run into any problems we haven't covered here.

3. 1788A-R Hardware R/C Unit ("HRemote")

3.1 PURPOSE

Although one or more 1788A's can be remotely controlled by a software program running on a computer, there are times when a dedicated hardware remote control is preferred. We engineered the 1788A-R Remote Controller to be easy to use and dependable enough for mission-critical applications.

Figure 3-1.
Front Panel View

Key Features

- One 1788A-R controls up to 16 1788A's (one Network Bank) at a time.
- Up to eight 1788A-R's can be used to control up to 128 1788A's in 8 Banks.
- That means up to 1024 mic channels!
- Ethernet networking
- MIDI Interface
- Each 1788A-R is bank assignable (1 to 8)
- Fully replicates 1788A controls and indicators
- Holds and manages up to 60 full Bank snapshots
- All presets recallable by MIDI
- MIDI control redirected by 1788A-R to 1788A's within the network Bank
- Rack-mounted and desktop configurations
- Super-reliable microcontroller based - no PC
- Can share network with one PC (or Mac) software remote controller

3.2 FRONT PANEL CONTROLS

3.2.1 Unit Select

The row of lighted pushbuttons along the top are used to select any one of the 1788A preamps that comprise the 16-unit Bank. The selected preamp is applied to the Control/ Display Panel area. The selection numbers, 1 through 16, represent Net number groups referred to as **Banks**, as described in Chapter 1 of this manual. If a button is selected that has no corresponding 1788A present in the Bank, then it will simply not respond.

3.2.2 Wake-up

Pressing this button refreshes network communications to all 1788A's in the Bank. You can use this button to re-teach the 1788A-R what now exists on the network within the

present Bank. It may also be necessary to do a wake-up upon any power-up of the 1788A-R.

During wake-up, the **Comm** indicators will show activity with units that respond to handshaking. After handshake and during test, Status LED's will temporarily appear yellow for all units present and responding. All units that are properly communicating will develop green Status LED's. Selections with no corresponding units present will display blank (dark) Status LED's.

The wake-up cycle time is about 1 to 8 seconds depending on how many units are on line. It can be initiated at any time without disrupting the network or causing the preamp units to malfunction.

3.2.3 Status LED's

This row of tri-color led's (red, yellow, green) indicates the status of the R/C link to 1788A's under varying conditions as shown in the following table.

Table 3-1. Status LED's

Color	Action	
	Wake-up	Preset Load
Green	OK	Loaded, OK
Yellow	Transacting	Mismatch*
Red	Unit Found But Improper Response	Unit Missing
Dark	No Unit Found	No Unit Present No Unit Expected

*Explained under 3.2.8

3.2.4 Comm LED's

These single-color red LED's show when commands are being sent to each of the sixteen units. They do not show unit responses.

3.2.5 Clip/Limit LED's

These single-color red LED's flash whenever any one or more of the 1788A's clip or limiter lights flash. The light is held for a long enough time to hopefully gather the attention of the operator. The holdover time can be adjusted by a hidden (secondary) function of the 1788A-R.

Changing the Holdover Time

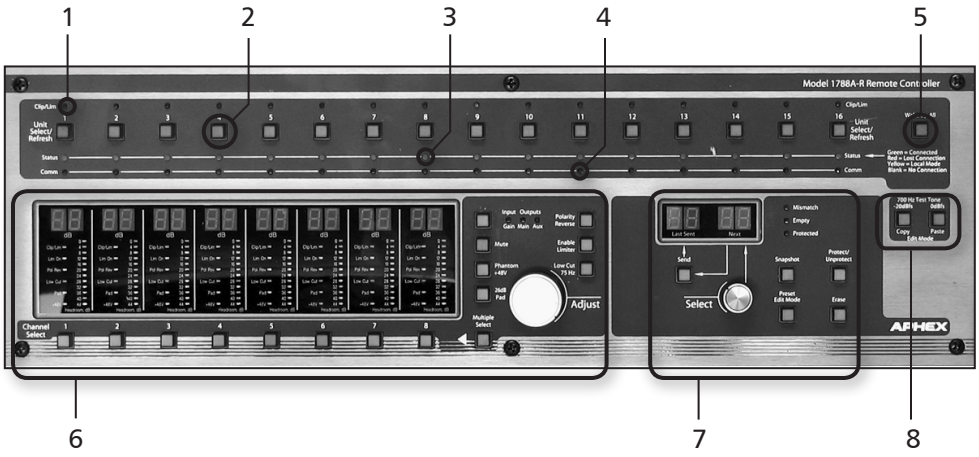
To change the holdover time, press **Both Tone Buttons** and the **Ch 6** button then release. This will attach the Adjust dial to the holdover setup. The preset display window will now show **CLXX**, where XX will be from 01 to 05. These codes represent various Clip/Limit holdover options according to the following table. You can change this number by rotating the Adjust dial. To escape from this control, press **CH 6** again.

Table 3-2. Clip/Limit LED Holdover Codes

Code	Function
CL01	Hold 1 Second*
CL02	Hold 2 Seconds*
CL03	Hold 4 Seconds*
CL04	Hold 8 Seconds*
CL05	Hold until cleared by pressing any Unit Select button.

*If occurs on unselected unit, light holds until selected.

Figure 3-2. 1788A-R Front Panel at a Glance



1. Clip/Limit LED's: Show when any channel of the 1788A is clipping or limiting. Serves as an alarm when possible gain correction is needed.

2. Unit Select Buttons: Allow instant selection of one of 16 preamps in the bank for display and control.

3. Status LED's: Indicate with 3 colors the condition of communications with 1788A's.

4. Comm LED's: Indicate data passing between 1788A-R and 1788A.

5. Comm Test: Re-teaches the 1788A-R what 1788A's in networked in the present bank. Tests communications.

6. Control/Display Panel: Duplicates a 1788A's set of channel controls.

7.Preset Manager Panel: Stores and recalls 60 snapshots of all preamps present in the bank.

8. Test Tone Panel: Duplicates the same buttons on the selected 1788A. Provides similar primary and secondary functions.

3.2.6 Test Tone Buttons

These buttons serve the same purpose as those on a 1788A. You can put up a -20dB or 0dB tone on any channel of the unit that is selected.

Putting Up a Test Tone

While holding down either the -20dB or 0dB Tone button, press any Channel Select button. The chosen tone level will be sent from that channel's audio outputs (analog and digital). You can't group-select tones, but you can sequentially press Channel Selects to run up more channels while holding down the Tone button.

To defeat the tone, press either Tone button again. The tone(s) will instantly (but clicklessly) revert back to the mic inputs.

Secondary Functions

The Tone buttons also serve to provide secondary (hidden) functions like display brightness control, display of the firmware version, and Clip/Limit light holdover time. Table 3-3 shows the secondary functions.

Table 3-3. Secondary Functions of Tone Buttons

Press	Function	Range
Both Tone Buttons Plus		
Ch 4	Clone 1788A-R's	n/a
Ch 5	Set MIDI Channel	1 to 16
Ch 6	Clp/Limit LED Holdover Time	5 Levels (CL01 to CL05)
Ch 7	Display Brightness	5 Levels (d_01 to d_05)
Ch 8	Firmware Version	Current Value

3.2.7 Control/Display Panel

This area of the 1788A-R's front panel replicates the 1788A's local control and display panel. It gives you the exact look of the selected 1788A's function status lights and meters. Metering data streamed back from the selected 1788A is displayed on the bargraphs approximately in real time. Because of high speed networking, indicator latency is minimal.

Taking Control

To control a specific mic channel, press its Channel Select button. All functions are now controllable by the 1788A-R's panel controls. You can choose Multiple Select and press any combination of Channel Select buttons to add to or remove from the group. All grouped channels will now come under influence of the controls.

Refer to the 1788A Instruction manual for more information about group behavior of the Gain controls.

3.2.8 Preset Manager Panel

The handling of presets has been made very simple and intuitive for the 1788A-R. Basically, you can take a snapshot of the bank of 1788A's and store it into a bin. You can lock the bin to protect it from alteration or loss, and you can edit the bin. Finally, you can recall a preset and "Load" it out to all 1788A's in the Bank.

Selection of a storage bin is made by the Select dial. Turning this dial changes the number seen in the right half of the numeric LED display window. To recall the selected preset bin, updating all 1788A's in the Bank, simply press the Load button.

Snapshots

Taking a snapshot is our vernacular for capturing a preset. Snapshots are of the whole Bank as it is defined at that moment. In other words, if only three 1788A's are placed in the 1788A-R's Bank, then only the three preamps will be snapped.

Protection

When you dial up snapshot numbers, the "Protect" LED will tell you if it has been protected. If so, you cannot erase or overwrite it. You can recall and edit it but it will have to be saved to an unprotected bin. You can protect and unprotect any snapshot using the Protect/Unprotect button.

Erasing/Emptying

Snapshot bins do not have to be empty before they can take another snapshot. They can be overwritten. However, to get rid of junk or obsolete presets, you can erase them so they will be read as "empty". This makes for better housekeeping. Any unprotected snapshot can be emptied by pressing the **Erase** button once. Empty bins are indicated by the "Empty" LED.

Loading a Snapshot

This is our vernacular for recalling a preset. Any selected snapshot, whether protected or not, can be Loaded to the bank of 1788A's. Simply select the snapshot number in the right side of the window labeled "Next", and press the **Load** button. When the snapshot is

finished loading, the number will be updated in the left side of the window labeled "Last Sent".

Mismatch Errors

When you load (recall) a snapshot into the bank of 1788A's, the 1788A-R will know if the bank has unit discrepancies and flash a yellow "Mismatch" alarm on any missing 1788A's in the bank that were included in the snapshot, or any 1788A's present that were not there when the snapshot was taken. If a connected 1788A is extra, outside the scope of the preset, its Status light will be green blinking to yellow. If any 1788A is missing from the scope of the snapshot, its Status light will be red or black blinking to yellow. Turning the Preset Select knob will re-display all mismatches if they have been cleared. Mismatches indications will be cleared by doing a Wake-up or pressing any Unit Select button.

Edit Mode

The editor is principally used to create hand-made presets with or without any 1788A's present. This will be your theoretical preset as you determine you want it. It won't be a snapshot of actual working preamps.

NOTE: This also a useful way to examine existing presets without propagating them.

3.3 SNAPSHOTS & EDITING

3.3.1 Live Snapshots

At any time, the present state of all the units in the present Bank can be captured into a preset bin. Presumably, as you perfect your preamp settings scene-by-scene, or show-by-show, you will want to create and update presets to be able to reproduce these settings on demand. You may also just want to save some simple setups to deal with typical conditions. For example, you might want to have a preset to mute all mics across the Bank, and then one to unmute them all. Whatever the case, taking a snapshot is the easiest way to make presets.

How to Take a Live Snapshot

1. Select a desired preset bin (snapshot number, 1-60) by turning the **Select** dial. It will appear in the right-hand window. If it is protected, unprotect it or choose another number. It does not have to be empty to take a new snapshot. The old data will all be erased automatically.

2. When you are ready to capture the operating parameters of the present Bank, press **Snapshot**. The bin will now be stored.

3. If you are satisfied with the snapshot, you should now **Protect** it.

3.3.2 Editing

Certain characteristics of the remote controller will change in Edit Mode. First, you will be able to select all sixteen units using the Unit Select buttons even if none are present. Second, none of your adjustments will be transmitted out to units. The 1788A-R's controls will serve only for programming your preset.

When you enter Edit Mode, the selected preset will be loaded into a workspace memory. You can adjust all the controls and settings for any selected unit. After you have selected and adjusted the desired units, pressing **Snapshot** saves a copy of the workspace

memory into whatever preset bin is showing in the right-hand window as long as it is not protected. While in Edit Mode you can select other unprotected preset bins before pressing Snapshot.

Presets created in Edit Mode are in every way equal to live snapshots. When recalled, they will expect the same Bank configuration as they were created for. They will display Mismatch errors like any other snapshot.

Editing Tools

Here are some useful editing tools:

1. **DELETE UNIT:** Pressing **Erase** in Edit Mode will delete the presently selected unit from the temporary workspace. Its Unit Select button will go out.

2. **COPY & PASTE:** Pressing **both TONE buttons** and then pressing the **Unit Select** of any unit will copy its complete table of settings. While still holding down both tone buttons, pressing any other Unit Select will paste the data into it. You can continue holding down the tone buttons and pasting the same data into as many other Unit Selects as you wish. It's an easy way to clone a preamp setup.

How to Edit

1. Press the **Edit** button. It will start blinking. The selected preset will be copied into workspace memory.

2. Unit Select the first preamp number you want to include.

3. Set all mic channel parameters as you want and then Unit Select the next preamp number you want to include and continue doing the same until you have completed your theoretical preset for the Bank.

NOTE: You can use the COPY & PASTE tool in Edit Mode. It can save you some time by initializing your included preamps. You can still re-select your included units and hand modify them before taking the snapshot.

4. Select an unprotected snapshot bin 1-60 (in the right-side "Next" window). It doesn't have to be empty. All existing contents will be deleted and overwritten.

5. Press Snapshot and the preset will be written into your selected bin.

6. Press **Edit** again to exit the Edit Mode.

Escaping From Edits

If you are in Edit Mode and you have not yet pressed the Snapshot button, your work will be deleted just by leaving the Edit Mode.

3.4 CLONING 1788A-R's

There may come a time when you need to copy all the stored presets from one remote controller to another. We have provided a relatively easy way to do that through use of the MIDI ports in a manner similar to cloning 1788A's (see Section 2.4).

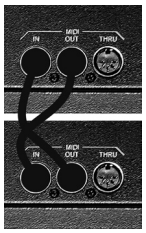
Synchronizing Procedure

1. Temporarily cross-connect the MIDI IN and OUT ports as shown in Figure 3-3.
2. Program both units to **MIDI Channel 1** (see section 3.7.2).
3. On the original unit, press **both Tone Buttons** and the **CH 4** Select button then

release. This transmits a dump to the other unit (the clone).

The original unit will begin sending it's parametric and label data to the receiving unit. When the transfer is complete, the clone will update itself to the new parameters and the panel indicators will align accordingly. The updated unit is now a clone of the original presets. Incidentals like the 1788A-R's display brightness won't be transferred.

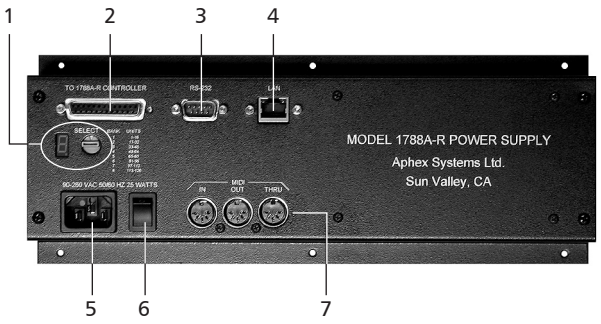
Figure 3-3. Connecting Two 1788A-R's for Cloning



3.5 POWER UNIT

The 1788A-R is a two-piece assembly with a Control Unit and a Power Unit. The power unit can be separated by a short distance if the Control Unit is to be desk mounted. When the 1788A-R is rack mounted, the Power Unit should be bolted directly onto the back of the Control Unit.

Figure 3-4. 1788A-R Power Unit



1. Bank Selector: Assigns the 1788A-R to one of 8 NET Number Banks.

2. Interconnect: Connects to the 1788A-R Control Unit. Uses standard straight-thru 25-pin D-Sub printer cable.

3. RS-232 Port: Used only for downloading firmware into the unit. Not used for remote control.

4. Lan Connector: 10/100 Base-T Ethernet port connects to LAN.

5. Power Input: 85-265V~/50-60Hz.

6. Power Switch

7. MIDI Interface: Used for indirect MIDI control.

3.5.1 I/O Located Here

The Power Unit contains not only the power supply, but also the Ethernet and MIDI interface connectors and the bank assignment selector.

3.5.2 Bank Selector

Each 1788A-R is assigned to a bank of NET numbers by a switch located on the rear of the Power Unit. The switch position is indicated by an adjacent LED numeric readout.

Table 3-4. Bank Definitions

Bank No.	1	2	3	4	5	6	7	8
Net Nos.	1-16	17-32	33-48	48-64	65-80	81-96	97-112	113-128

3.5.3 MIDI Jacks

MIDI IN, OUT and THRU are supported.

Refer to Section 2 of this manual for full coverage of applying MIDI control to the 1788A-R.

3.5.4 RJ-45 Ethernet Jack

This is the exclusive portal for piping remote control to 1788A's. It must be connected to a proper 10 or 100 Base-T LAN structure that has a DHCP server or router. Details of proper network construction are covered in Section 4 of this manual.

3.6 INSTALLATION

The Model 1788A-R occupies three rack spaces (135mm or 5-1/4 inches) of a standard EIA equipment rack.

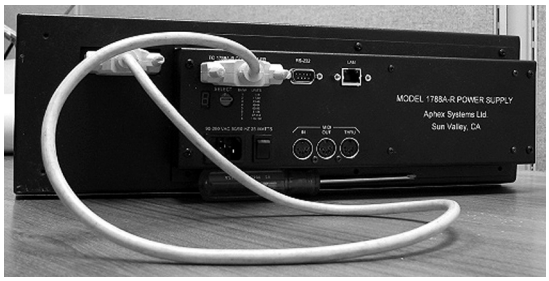
3.6.1 Interface Cable

The Power Unit and Control Unit are connected together through a standard 25-pin D-Sub **straight-through** printer cable. The length of this cable should be less than 6.5 feet (2 meters) to prevent power loss. **Use only shielded cables.**

3.6.2 Rack Mounting

When rack mounting, use appropriate cushioned rack screws with the supplied rack ear adapters. Never restrict air flow through the device's vents. When installing the units into a rack, distribute the units evenly. Otherwise, hazardous conditions may be created by an uneven weight distribution. Connect the unit only to a properly rated supply circuit. Reliable earthing (grounding) of rack mounted equipment should be maintained. Try not to position the 1788A-R directly above devices that generate excessive heat such as power amplifiers (unless adequately ventilated).

Figure 3-5. Rack Mounted Configuration



The Power Unit should be bolted directly to the back of the Control Unit using furnished UNC 6-32 x 1/4 inch screws. Both units' 25-pin D-Sub connectors should be connected together using the supplied short-length cable.

3.6.3 Desktop Mounting

The Power Unit may be remotely located to permit the Control Unit to lay flat on a desktop. For this purpose, a second D-Sub side-facing connector is provided for flat cable entry. It's a good idea to place non-slip adhesive rubber feet on the Control Unit's under-side. The Power unit may be mounted under the desk or on a sidewall. Make sure not to block the air vents.

3.6.4 AC Line Connection & Power

Use only a power cord that carries approvals for use in your location. The 1788A-R's

internal power supply is designed to operate from all nominal power sources from 85 to 265 volts a.c. at 50/60Hz without requiring the user to change any settings. In case of failure, do not attempt to change the internal fuse because it will never blow unless the power supply fails catastrophically. The power supply will need to be serviced by a competent service technician in such a case.

Figure 3-6. Desktop Configuration

3.7 MORE ABOUT USING THE 1788A-R

3.7.1 Assigning A Bank

All 1788A-R's must be assigned to a NET Number bank. This is done by a rotary switch on the Power Unit (see Fig. 3-5). Banks from 1 to 8 can be selected. Multiple units should never be assigned the same Bank number.

3.7.2 Setting Up The MIDI Channel

If you intend to use a MIDI controller with 1788A-R's, then you need to set up their MIDI Channels. This is done by use of a secondary function of the Tone Buttons.

1. Press **both Tone buttons and Channel 5** and release. The Adjust dial will be transferred to the MIDI channel.

2. Spin the **Adjust** dial until the desired channel number is seen in the display window.

3. When done, press one of the **Tone** buttons to escape.

You can check the channel number by the above procedure without turning the Adjust dial.

NOTE: See **Section 2.2.6** relating remote control strategies to the setting of the MIDI Channel numbers.

3.7.3 Initial Sync

When 1788A's and 1788A-R's are powered up while connected to a network, or plugged into a network when they do not have an IP address yet assigned, they will communicate with the DHCP Router and receive unique IP addresses automatically. Only when a unit has a unique IP address can it become active on the network. This will take place quite rapidly. The 1788A-R will automatically begin receiving meter data from preamplifiers and will sort out their IP addresses and Net numbers. All units with NET numbers that fall within the 1788A-R's Bank are assigned to the Unit Select buttons that coordinate with each Net number.

Sometimes, depending on when the remote controller and preamplifiers received their IP addresses, it may be necessary to use the Wake-up function to get the controller attached to all preamps in its bank and clear all red lights. This is a good practice just to assure full synchronization of the constellation some time after all units have been powered up.

NOTE: Avoid giving more than one 1788A the same NET number. It will cause network errors and unpredictable results.

3.7.4 Coexisting with a Software R/C

One PC or Mac computer running Aphex 1788A R/C software can operate in concert with up to eight 1788A-R's. Read Section 5 to learn about using the software controller.

3.8 MULTIPLE SELECT GROUP BEHAVIOR

When using **Multiple Select** to create a group, you will pass certain characteristics to the controls.

1. All **on/off** functions will synchronize and follow the control of any individual in the group. For example, you switch on the PAD of any one channel in the group and all other PAD's will also switch on. Any function not deliberately operated will remain in the original state of member mic channels, however. To make all grouped channels the same, you need to operate all the on/off controls.

2. **Input, Aux, and Main Gain** values will remain **Relative.** Even if you top or bottom out all the controls, an **overscale memory** will retain their original relative difference and when you bring the gains back out of limits, they will regain their relative values. This is good for maintaining a deliberate mic balance while nudging them all up or down a certain amount. This characteristic is identical to the **Local Control** characteristics that are covered in the 1788A Owner's Manual.

3. Input, Aux and Main Gain can be group **equalized to limits** by first Multiple Selecting a group, running their gains to the upper or lower limit, and turning Multiple Select button off and on again. Now the overscale memory is erased, and all controls will track at the same gain as any one of the group that is adjusted.

4. Building a Proper Network

4.1 STANDARD PARTS

Networks used for remotely controlling 1788A's are built from standard Ethernet components such as Routers, Hubs and Switches. Standard CAT5/6 Ethernet cabling is used throughout.

4.2 NETWORKING SPEED

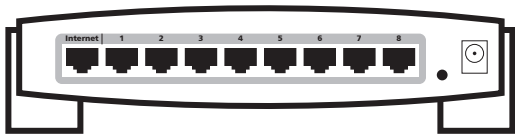
The network can run at 10 Base-T and 100 Base-T speed. We recommend using 100 Base-T hardware, especially when the number of preamps and controllers exceeds a few units.

4.3 DHCP SERVER

The Aphex 1788A network requires a Dynamic Host Configuration Protocol Server (DHCP Server). This is because IP addresses are not hardware assignable to individuals in the network constellation. Each IP address must be served up dynamically, on demand. This greatly simplifies the administration and flexibility of the network in certain ways.

The DHCP Server can be a hardware unit or a computer configured to be a DHCP Server. Hardware DHCP Servers usually take the form of a DSL Internet Router. These are inexpensive and reliable. You need not have an Internet connection. In fact, we highly recommend avoiding it. The Internet Port should just be left open.

Fig. 4-1. Typical DSL Router
(Containing DHCP Server)



Important Rules

1. Be sure your DHCP Server has ports **1198** and **1199** available and unlocked.

2. Only **one DHCP Server** can be allowed to exist on the LAN. If any additional Routers are attached to the LAN, they must have their DHCP Servers disabled.

4.4 CAT 5/6 WIRING

A 1788A network likes to run clean. No error correction is used, although fault tolerance is built into the system. Anything less than Cat 5 cable is risking dropped commands. Standard commercial wire is suitable.

4.5 HUBS & SWITCHES

Unless your system is very small, you will need to gain more Ethernet ports than what came on your Router. Or, you may need to run one long network line from the Router to a remote rack of 1788A's. In that case, we recommend incorporating Switches rather than Hubs to expand the network. Figure 2-5 shows some examples where Switches are shown to split out from the Router. Hubs, although cheaper, are not recommended. We have seen them jam up requiring a complete restart with as few as four 1788A's.

4.6 SHARING EXISTING LANs

Usually, the Aphex preamps and controllers can share almost any conventional LAN with certain minimum requirements. First, there must be a DHCP Server on the LAN. Second,

if there are any fixed IP addresses on the LAN, the Router has to be programmed to avoid issuing them to other clients. In other words, there can be no IP address duplications on the LAN. The DHCP Server (or Router) must have enough IP numbers available to handle all DHCP clients on the LAN. There cannot be a firewall splitting up any part of the LAN, but the whole LAN can be inside a firewall. You need to check with your network administrator to be sure ports 1198 and 1199 are present are unlocked. If unreliable results are obtained, then your common network might be overburdened. You should then set up a separate dedicated network for remote control.

4.7 SUITABLE HARDWARE

Purportedly, all networking products are generic. Any brand Router or Switch should work equally well. We have had little trouble using various name brand networking products, but in some cases low priced off-brand boxes were unreliable. For that reason, we recommend using well known equipment brands only. Other than that, you should be able to mix and match network equipment for a successful network.

NOTE: Passive Hubs don't work at all with a 1788A LAN. Be sure to use only active (self powered) Hubs.

4.8 TYPICAL NETWORK DIAGRAMS

Router as Base

This is preferred because it puts the Router (and more importantly its reset button) more conveniently near the operating position, just in case it goes out of whack. That's unlikely, but it's an imperfect world we live in. Figure 4-2 shows a typical setup using an Internet Router to form the basis of a network. It is also possible to run a single Cat 5 line from the Router to one of the Switches, and then connect the other Switches off that Switch. It should be obvious that you have many options available depending upon the layout of your 1788A constellation.

NOTE: You would need no switches at all if your Router has enough ports handle everything. The main concern would be minimizing the number of Cat 5 runs that are needed to connect preamps at a remote location. Placing a Switch at the remote location requires only one Cat 5 run from the Router.

Router As DHCP Server Only

Figure 4-3 shows a network configured whereby the Router plays only a DHCP Server role. This may sometimes be preferred in order to reduce any latency or slowness due to the Router's built-in filtering and firewall features. We have seen no evidence of this being a problem so far, but as installed systems get quite large, it may become a concern.

NOTE: The Router can be attached to any available port of any Switch in the network.

Summary

Detailed Ethernet theory and practice is far beyond the scope of this chapter, but we have tried to make it easy for you to understand the basic networking techniques for connecting a constellation of 1788A's with their remote controllers. Since all of the preamps, and R/C units are dynamically identified by the DHCP Server, setting up a working network is very easy. It's almost "plug and play". If you experience problems with networking 1788A's and their Remote Controllers, contact Aphex Technical Support for help.